Business-Technology Alignment

TECHNOLOGY INFRASTRUCTURE BLUEPRINT

November 2, 2001

TO: 55

Deliverable #: 55.1.7

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1. OVERVIEW

The Technology Infrastructure Blueprint (TIB) will present the following:

- The objectives of the SFA TIB
- Identification of the technology infrastructure domains supporting the Target State Vision
- A matrix that illustrates the distribution of production infrastructure platforms, interfaces, and other elements that are in use with each of the SFA systems (FMS, FP DataMart, FAFSA, eMPN, Portals, etc.)
- Summaries of each system on the SFA IT production infrastructure, including a brief description, a list of technology elements, and a list of interfacing systems (this collection of systems includes Modernization systems that are in both development and production)
- The operations and development infrastructures common to the majority of modernized SFA systems

2. INTRODUCTION

The TIB describes the common, enterprise-wide technical infrastructure to support SFA at all levels of the organization. In addition, it also contains:

- A representative set of technology diagrams, models and statements that guide SFA on how to build a consistent, compatible technical infrastructure based on SFA defined standards and which support SFA's modernization vision
- A high-level design illustration of the essential components of the SFA technical infrastructure
- A description of the technical infrastructure that is the foundation for the SFA application portfolio defined by the target state vision

The architecture elements that the TIB details include the development architecture, production architecture, and operations architecture. These are defined as follows:

- Development architecture infrastructure – A unified collection of technology infrastructure elements for constructing and maintaining application software
- Production architecture infrastructure – A unified collection of technology infrastructure elements upon which application software runs
- Operations architecture infrastructure – A unified collection of technology infrastructure elements required to keep a business application production or development environment operating at the designed service level

This document will be updated and published at a minimum on an annual basis through the BTA process.

3. SFA INFRASTRUCTURE DOMAINS

SFA Infrastructure is based primarily on four core infrastructure domains within the SFA technical environment, which are targeted at reducing the need for customized point-to-point system interfaces. The four new domains include the Internet Domain, the Security Domain, the Enterprise Application Integration Domain, and the Enterprise Data Domain. These four domains combined with the current Legacy Domain, make up the SFA enterprise infrastructure. These domains build upon and align to the current Application Architecture Target State Vision. Together the five domains provide the necessary infrastructure to implement a service-oriented infrastructure. However, in order to provide this infrastructure each domain must provide support for seamless integration between domain touch-points. Each domain must provide a set of interfaces or connectors that allow integration with the services of intersecting domains. For example, the Internet Domain must provide interfaces to the Security Domain in order to provide for absolute identification of the requesting component as well as authorization of allowable services. The Internet Domain must also provide interfaces to the Data Domain in order to provide persistence for stateful business objects. The Data Domain must provide adapters to disparate data sources in order to feed the extract/transform/load process. The Enterprise Architecture Integration (EAI) Domain must provide connectivity to different legacy infrastructures and data sources in order to provide integration with existing SFA systems.

Figure 1 shows how the five domains overlap to provide seamless integration between domain services. The EAI layer is the glue for providing the integration between the domains where interfaces do not exist. The EAI layer provides a set of application adapters and communication services that can span domains thereby providing additional integration points between domains.

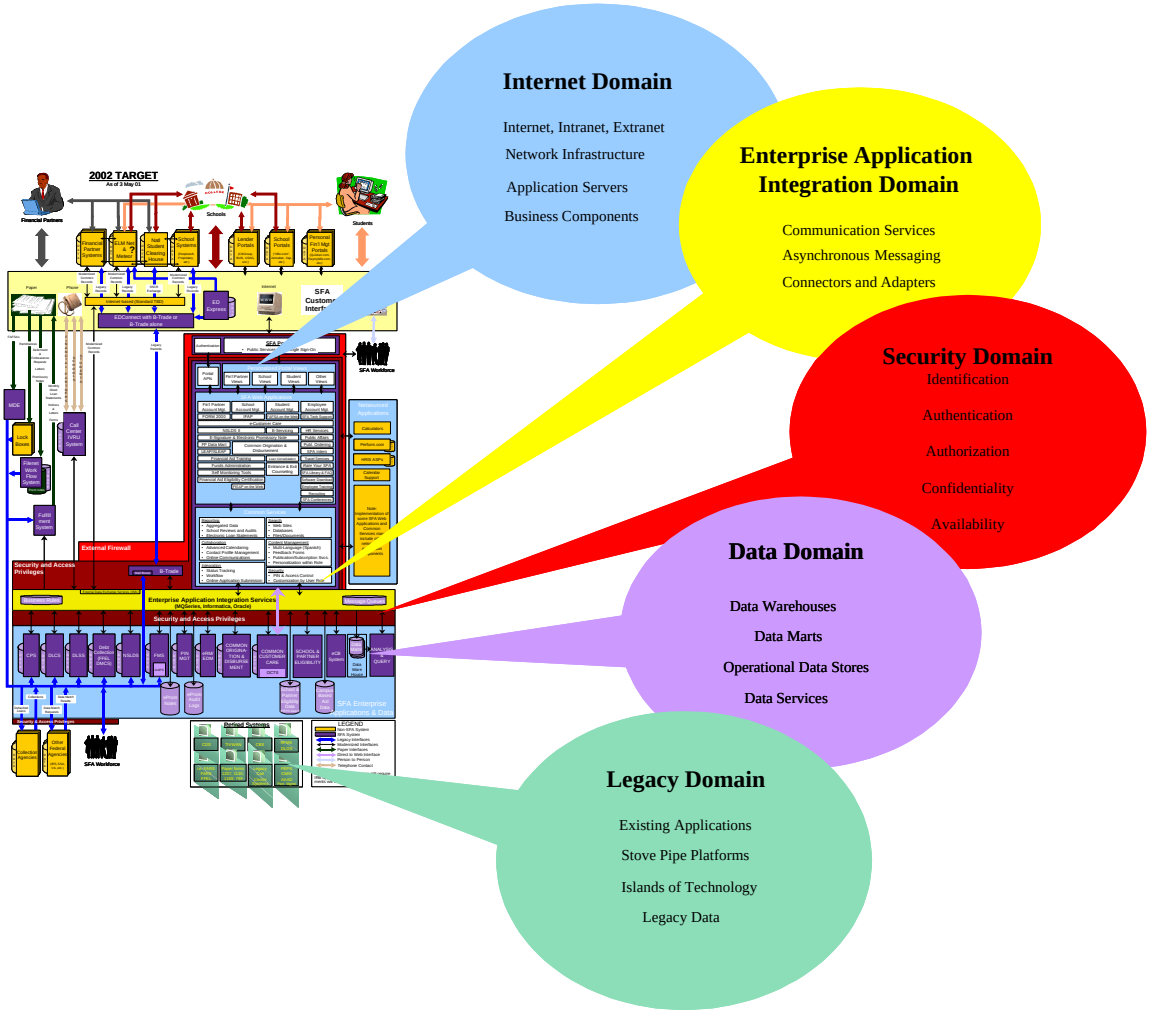

Figure 1 – SFA Infrastructure Domains

3.1 SFA Domain Topologies

The execution topologies required to support the Infrastructure Domains are shown in graphical form in the following sections. Each topology diagram will consist of several nodes that represent the function of that node. The execution topology of each SFA Domain is described and mapped to a set of vendor products.

3.1.1 The End-to-End Domain Topology

The following diagram provides a high-level view of the SFA Service-Oriented Architecture. The diagram depicts the run-time topology necessary to support all of the infrastructure domains. Some minor elements of each domain have been excluded to allow for diagrammatic elegance.

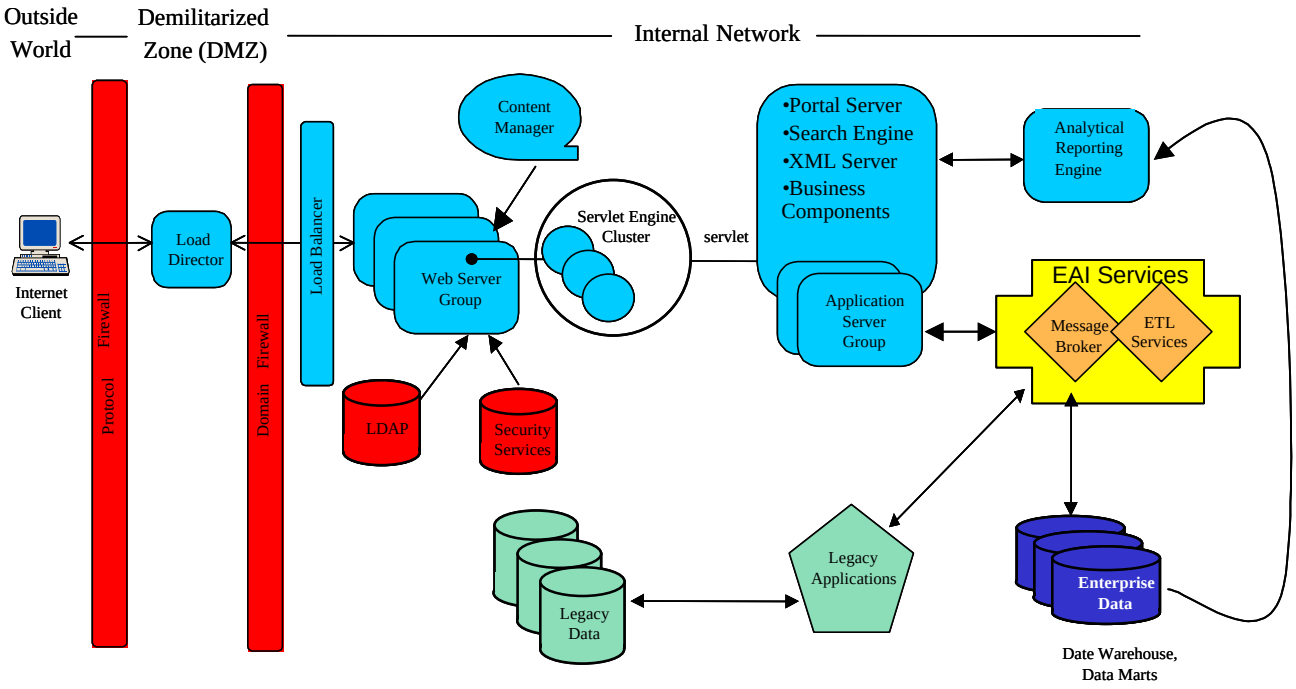

Figure 2 – End-to-end Domain Topology

3.1.2 Internet / Security Infrastructure Domain

The Internet / Security Infrastructure (Figure 3) supports the secure delivery of web-based applications to SFA's users on the World Wide Web (WWW). Specifically, the domain provides the infrastructure necessary to support the delivery of web based thin-client applications. The topology defined in this section defines a highly scalable and available feature rich enterprise Internet architecture. The implementation of this infrastructure within SFA will be deployed in stages according to application or system requirements. For example, the implementation of LDAP and security servers will be deployed in the later stages of the implementation of the overall technical architecture.

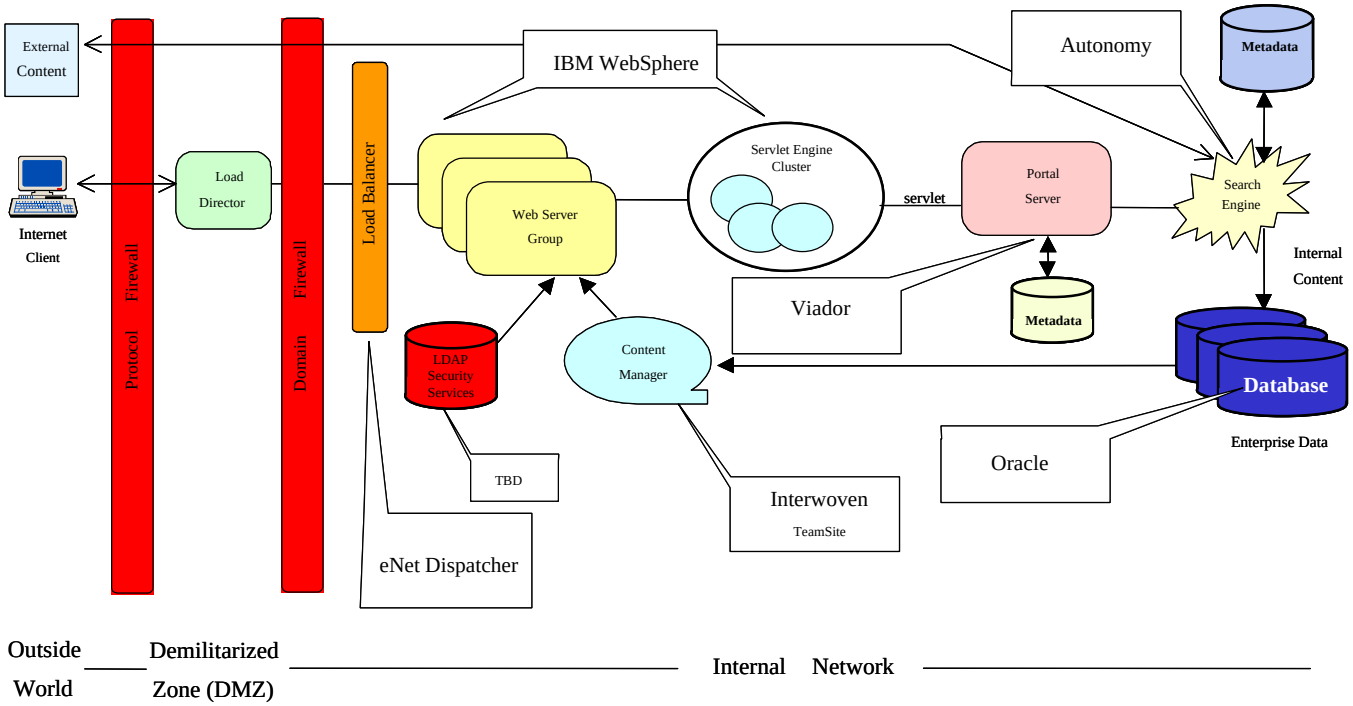

Figure 3 – Internet / Security Infrastructure Diagram

Note: Elements that are prefaced by a * will be implemented in the later stages of SFA technical architecture.

The Internet Domain includes the following components or nodes:

- Protocol and domain firewall nodes – Firewalls provide services that can be used to control access from a less trusted network to a more trusted network. A protocol firewall provides screening routers according to protocol type. Domain firewalls provide application gateways to applications located within the enterprise.
- Load balancing and caching node – The load balancer provides horizontal scalability to the web servers by dispatching Hypertext Transfer Protocol (HTTP) requests among several identically configured web servers. This node may also provide caching for frequently accessed web pages.
- Web Server Node – The web server node is an application server that includes an HTTP server and is typically designed for access by HTTP clients and to host presentation logic. The web server also provides services for serving other protocols like FTP, sound and streaming video.
- Web Application Server Node – This node provides the infrastructure for component based application logic. The web application server(s) provide the underlying services for running servlets, JSPs, EJBs and CORBA objects.

- Search Engine Node – Provides services for searching data and returning uniform resource locator (URL) links to data that matches the provided search criteria.
- Content Management Node – This node manages the static content that is accessible through HTTP links. The content must be managed according to conventional configuration management techniques.
- *Directory and Security Services Node – These nodes supply information on the location, capabilities, access privileges and various attributes related to resources and users known to the enterprise. This node supplies security services for authentication and authorization to enterprise resources according to users privileges.
- Portal Server Node – The portal server node provides the services to dynamically define a standardized enterprise look and feel to web applications. The portal server also provides the user with the ability to personalize web applications according to their preferences.

3.1.3 The EAI Infrastructure Domain

The Enterprise Application Integration (EAI) Domain provides the services necessary to support application integration across the SFA Enterprise. The topology supports the implementation of an asynchronous messaging back-plane that forms the basis for the deployment of a hub and spoke network infrastructure. The topology also supports application connectivity and transaction processing through the integration of pre-built application adapters, gateways and connector frameworks. The following topology diagram depicts execution topology and product mapping for the EAI Infrastructure Domain.

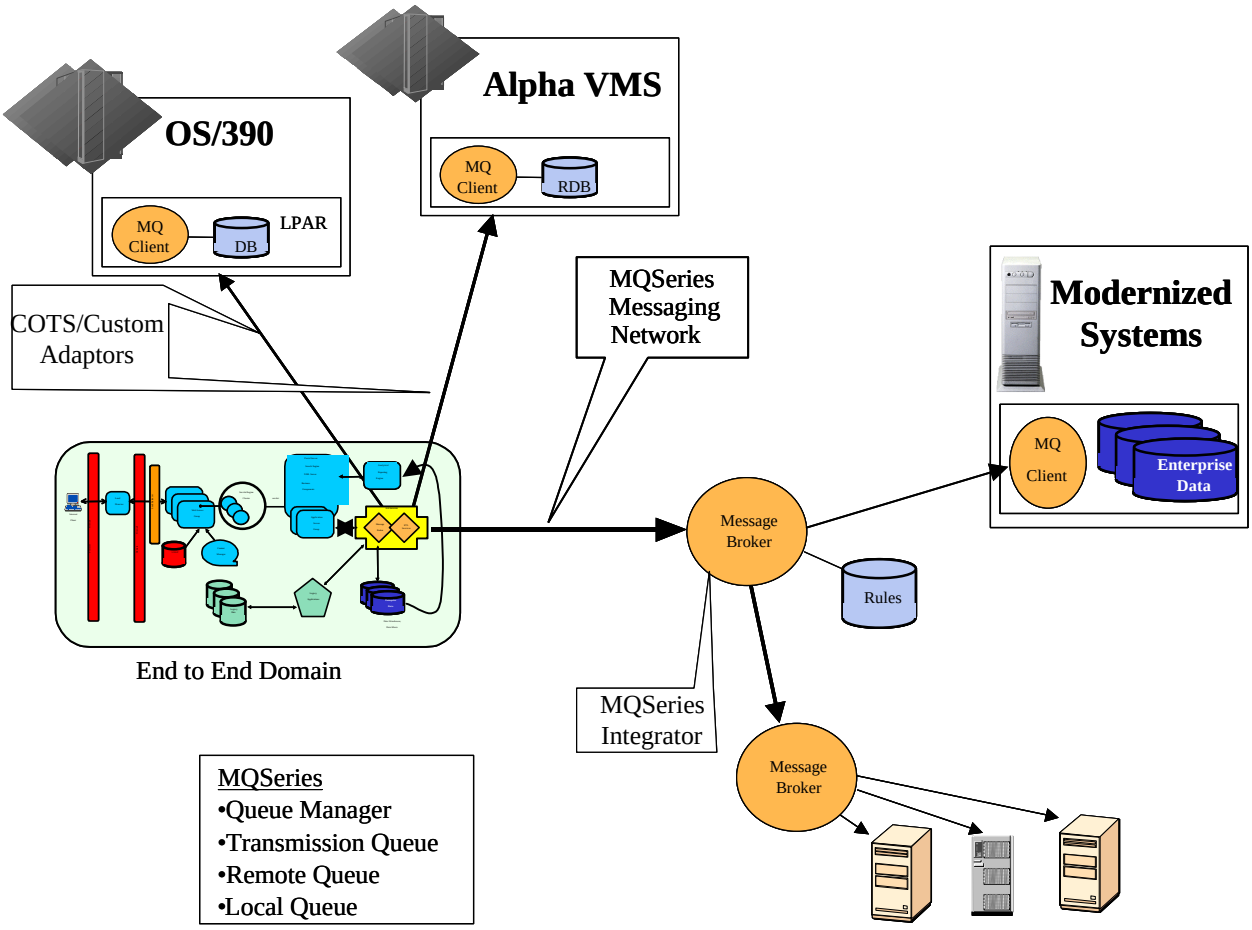

Figure 4 – EAI Infrastructure Domain

The EAI Domain topology includes the following components or nodes:

- Queue Managers – Queue Managers are run-time processes that are responsible for managing queues of messages for application programs using International Business Machine's (IBM) MQSeries. Queue Managers help maintain the flow of messages through a queue and manage communication links between other queues.
  - Message Broker -The role of the Message Broker is to provide a layer of logic to the messaging layer. The Message Broker is the 'glue' between intercommunicating applications. The Message Broker ensures that messages are routed correctly between applications and in a format in which the applications can understand each other. SFA applications will use the Message Broker MQSeries Integrator (MQSI) to provide a mechanism for:
  - Intercommunication between applications that are served by the application server

- Asynchronously obtaining data from legacy applications
- Asynchronously updating legacy applications
- Routing data to and from Enterprise Data Warehouses and Data Marts.

- WorkFlow Server – The WorkFlow node uses the messaging infrastructure for communication. The role of a WorkFlow Server is to automate business processes involving people and applications to give the enterprise added control over business activities. In the case of SFA it allows the developer to establish rules for managing updates to applications across the enterprise.
- Application Adapters - Application Adapters provide direct connectivity to applications and disparate data sources. Application Adapters allow applications to coordinate transactional updates across different data sources. Application Adapters are used by Application Servers such as Component Broker (CB) to provide support for On-Line Transaction Processing (OLTP).

3.1.4 Data Infrastructure Domain

The data layer consists of two segments in the SFA Data Domain, the legacy data domain and the Enterprise Data Domain.

Legacy Data Domain

The Legacy Data Domain (LDD) is based on existing data stores used by the current legacy infrastructure. Legacy applications and the LDD comprise the Legacy Domain. The majority of information stored in the legacy data domain is backed by DB2 on the OS/390. Direct access and acquisition of data stored in DB2 is not possible because the database schemas are not normalized and highly coupled to their respective applications. Data stored in the legacy data domain must be considered a secondary data repository once its controlling application is deprecated or duplicated.

Enterprise Data Domain

The Enterprise Data Domain (EDD) is the data repository that will be supported by future enterprise applications. The Enterprise Data Domain is comprised of data warehouses, data marts and operational data stores. The EDD is accessed and updated by applications that live in either the Internet or EAI Domain. The data stored in the EDD will be considered to be the ‘official’ copy of SFA’s corporate data. The EDD provides Department of Education with a more normalized data schema that lends itself to the use of business components and object relational mapping. The EDD will be updated in real-time while the LDD will have some period of update latency. This will be true only when a new infrastructure application is responsible for controlling updates to the same logical schema in the EDD.

The following diagram depicts the execution and product mapping for the SFA Enterprise Data Domain:

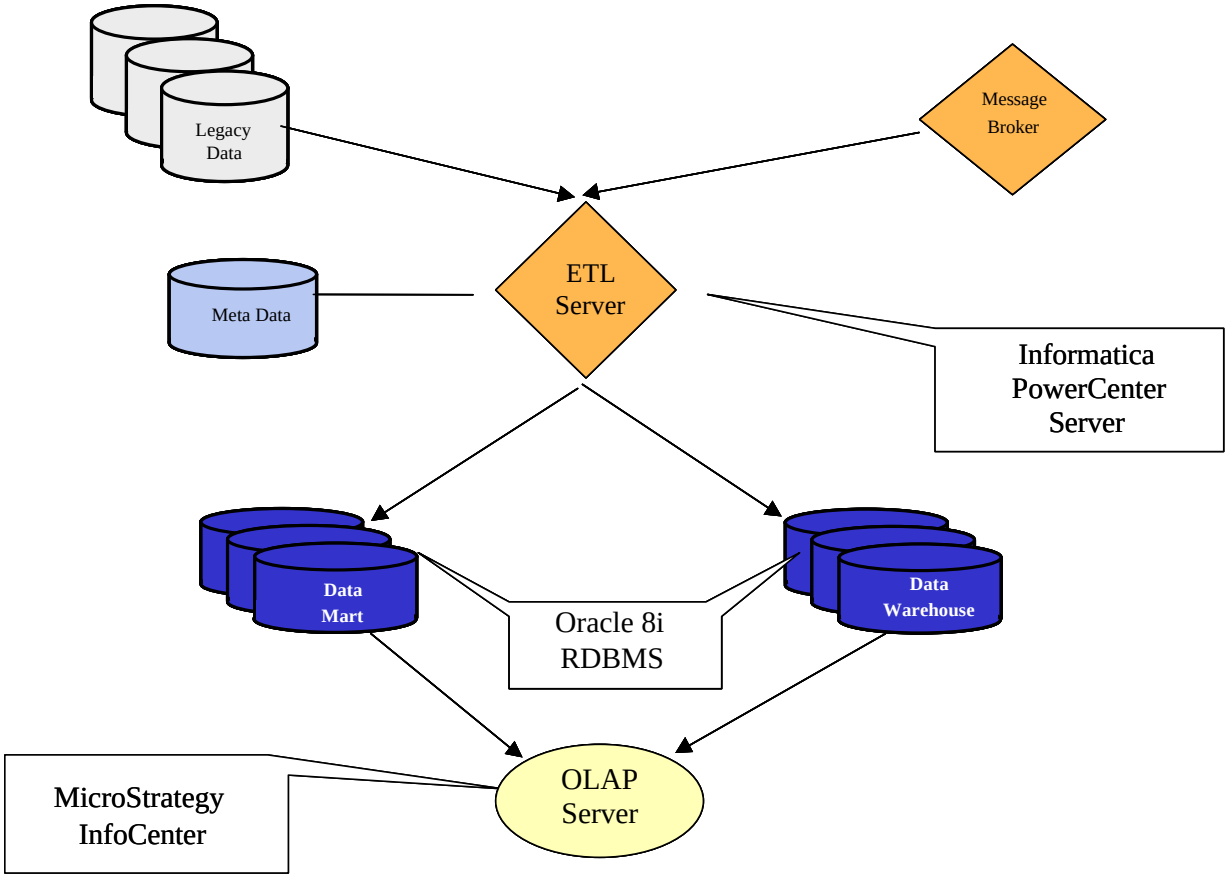

Figure 5 – Data Infrastructure Domain (EDD)

The Data Domain includes the following components or nodes:

- ETL Node – The Extract Transform Load (ETL) node provides the services necessary to perform the Extract, Transform, Load and Distribute processes used to create the Data Warehouse, Data Marts and Operational Data Stores.
- OLAP Node – The On-Line Analytical Processing (OLAP) nodes role is to provide a real time reporting engine capable of analyzing the large data sets usually associated with a data warehouse.
- Database Node – The database node provides support for implementing a centralized database that collects, organizes and stores data from SFA's operational systems to provide a single source of integrated and historical data for the purposes of the end-user reporting, analysis and use in decision support and Customer Relationship Management (CRM) systems like Siebel.

4. PRODUCTION INFRASTRUCTURE SUMMARIES

Each system on the SFA IT production infrastructure is detailed with a brief description and a SFA infrastructure diagram. The programs detailed include:

SFA Modernization Systems

CFO Data Mart

Common Orig. & Disbursement (COD)

Credit Management Data Mart (CMDM)

eCampus Based System (eCB)

Enterprise App. Integration (EAI)

eServicing

FAFSA 6.0

Financial Mgmt. Systems (FMS)

Financial Partners DataMart (FPDM)

HR Modernization

Portals

SFA Intranet

SFA to the Internet

SFA Legacy Systems

Central Processing System (CPS)

Direct Loan Consolidation System (DLCS)

Direct Loan Origination System (DLOS)

Direct Loan Servicing System (DLSS)

Fed. Family Ed. Loan Program (FFEL)

Info for Financial Aid Partners (IFAP)

National Student Loan Database System (NSLDS)

Post-secondary Education Participants System (PEPS)

Recipient and Financial Mgmt Sys (RFMS)

4.1 SFA Modernization Systems

The Technology Infrastructure Blueprint includes infrastructure details on those SFA Modernization systems that have infrastructure elements that are relevant to the standardization, coordination, and integration of technologies among SFA Modernization and Legacy systems. For quick reference, a matrix of SFA systems and technologies is provided in Appendix A.

4.1.1 CFO Data Mart

Description

The CFO Data Mart provides the CFO with an automated financial analysis and reporting process. Financial Management Systems Software (FMSS), a Department of Education system, serves as the source system for data for the CFO data mart. User-supplied cross-reference data also has been used to populate the mart (e.g., Channel, Lim, Activity). FMSS performs nightly extracts of activity from the previous day. This data is exported via FTP to the Informatica server at the VDC. Informatica then imports the data into Oracle, perform the necessary transformations, and populates the CFO data mart. The data mart is accessed by MicroStrategy Intelligent Server to satisfy user requirements that are sent via a web interface. Users access the CFO data mart directly through the SFA intranet.

The CFO, FP, and CM Data Marts have identical architectures with the exception that CFO is on Oracle 8.1.7, while FP and CM are on 8.1.6.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
Microsoft IIS 4.0	Webserver
Microstrategy Intelligence Server 7.1.0 Release 4	Business analysis server
Microstrategy Web 7.1.0 Release 4	Web-reporting tool
Microstrategy Desktop 7.1.0 Release 4	Business data management tool
HP-UX 11.0	Server OS
Sun Solaris 2.6	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8i 8.1.7	Database
Informatica PowerCenter Server 1.7	Data acquisition and transformation tool

Enterprise Services:

Product	Use
Tripwire 2.4	Host intrusion detection

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
FMSS	From FMSS	FTP

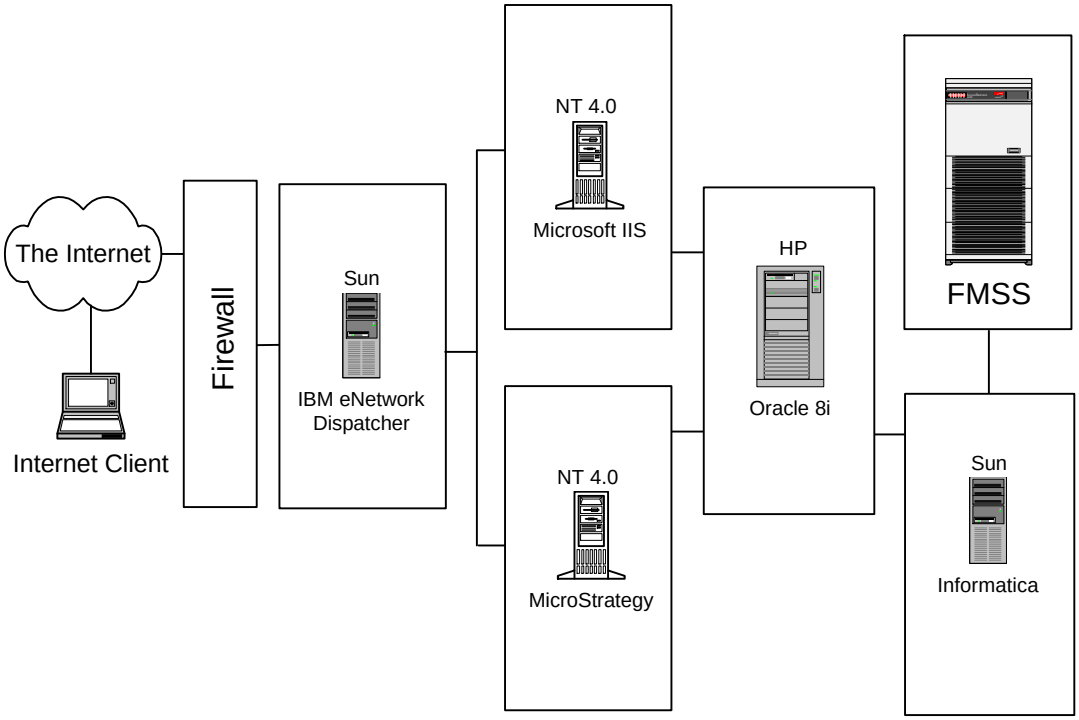

Figure 6 – CFO Data Mart Technology Infrastructure

4.1.2 Common Origination & Disbursement (COD)

Description

The COD application will simplify the process for schools to obtain financial aid for their students. COD supports the SFA objective of achieving an enterprise-wide solution that provides real-time data to students, schools, and financial partners via web portals. In addition, the COD solution will provide SFA with cost efficiencies. COD will enable SFA to deliver financial aid for Pell Grants, Direct Loans, and Campus-based programs through a common process. DLOS and RFMS are legacy systems that are being replaced by COD.

COD resides on a proprietary architecture at subcontractor Total Systems (TSYS). This is an evolving architecture that uses IBM MQSeries Messaging and Integrator for connectivity to SFA EAI.

Infrastructure Technologies:

Product	Use
TSYS Components	Proprietary subcontractor architecture
IBM MQSeries Messaging (TSYS version)	SFA EAI interface transport layer
IBM MQSeries Integrator (TSYS version)	SFA EAI message transformation and routing

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
CPS	Bi-directional	MQSeries Batch
DLOS	Bi-directional	MQSeries Batch
DLSS	Bi-directional	MQSeries Batch
FMS	Bi-directional	TBD
NSLDS	Bi-directional	MQSeries Batch
PEPS	PEPS to COD	Transactional
Student Aid Internet Gateway (SAIG)	Bi-directional	MQSeries Batch

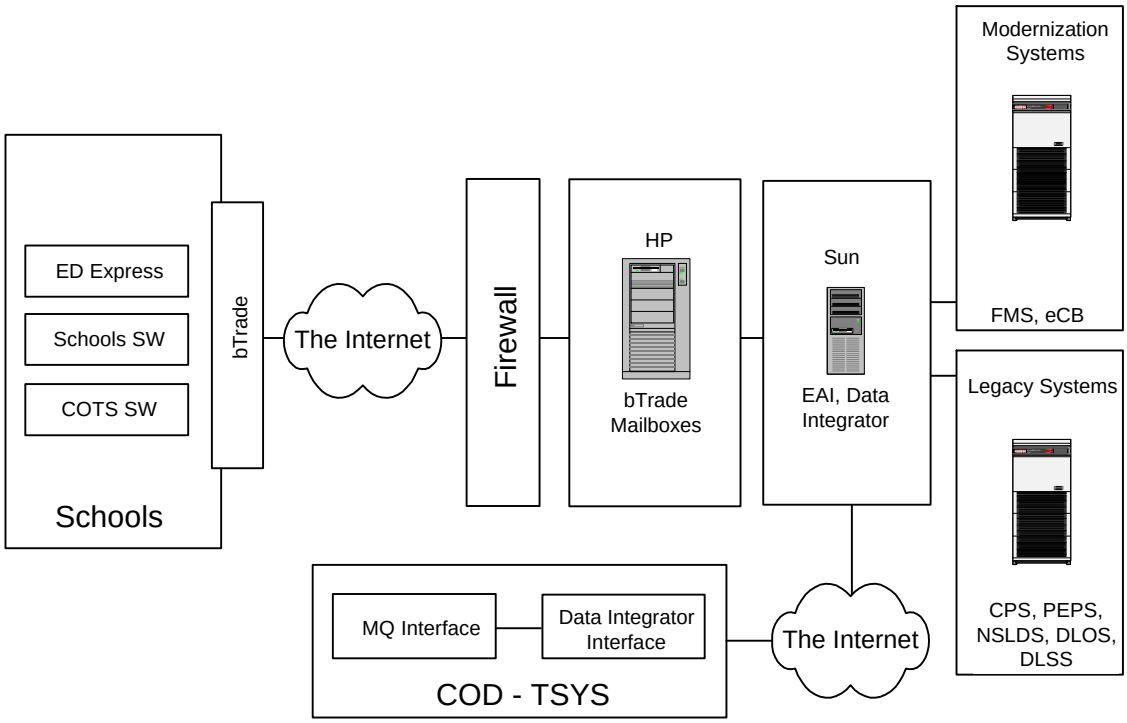

Figure 7 – COD Technology Infrastructure

4.1.3 Credit Management Data Mart

Description

FARS is the legacy accounting and reporting system for loan servicing. The accounting component of FARS is being replaced by FMS; however, there are other functions that FARS does today that FMS does not cover. The Credit Management Data Mart (CMDM) is being created to support reporting requirements at the detailed financial transaction level that FMS cannot support. The functional objectives of CMDM will include:

- Provide SFA CFO and Student Credit Management with a tool to report on detailed financial transactions
- Provide a transaction register to FMS for DLSS transactions
- Start to provide Credit Management and other departments a tool to complete MIS reporting from Direct Loan Data
- Provide access to end users so they can retrieve reports as needed
- Provide access to designated SFA users so they can create new reports

CMDM provides various levels of reporting capabilities to end-users. It serves as the primary reporting tool for the Direct Loan Program at the borrower level.

The CFO, FP, and CM Data Marts have identical architectures with the exception that CFO is on Oracle 8.1.7, while FP and CM are on 8.1.6.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
Microsoft IIS 4.0	Webserver
Microstrategy Intelligence Server 7.1.0 Release 4	Business analysis server
Microstrategy Web 7.1.0 Release 4	Web-reporting tool
Microstrategy Desktop 7.1.0 Release 4	Business data management tool
HP-UX 11.0	Server OS
Sun Solaris 2.6	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8i 8.1.6	Database
Informatica PowerCenter Server 1.7	Data acquisition and transformation tool

Enterprise Services:

Product	Use
Tripwire 2.4	Host intrusion detection

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
FMS	From FMS	(TBD)
DLSS	Bi-directional	Informatica

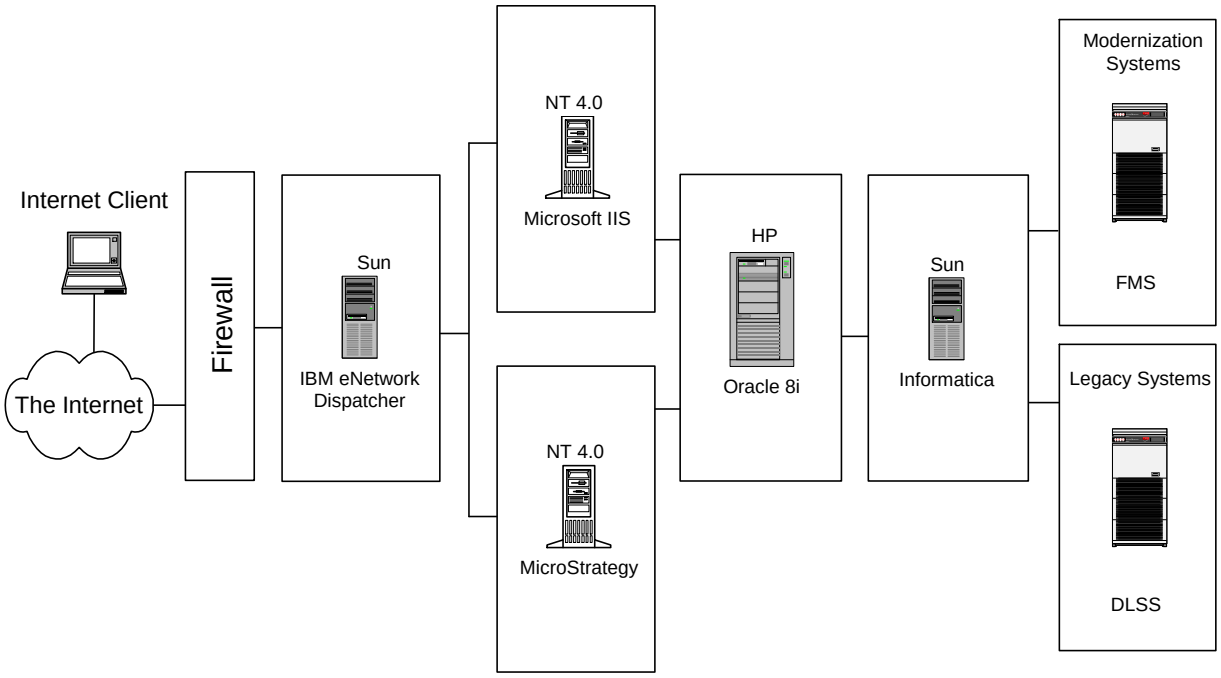

Figure 8 – Credit Management Data Mart Technology Infrastructure

4.1.4 eCampus Based (eCB)

Description

This initiative modernized the legacy Campus Based System. The storage of data in its legacy form made it very difficult for SFA staff and institutions to get access to information when and how they needed it. eCB transformed the CB application into today's technology by moving it off of the mainframe scheduled for retirement. eCB provides efficient interaction with other SFA systems (FMS, COD, etc.).

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
Microstrategy Intelligence Server 7.02	Business analysis server
Microstrategy Web 7.1	Web-reporting tool
Microstrategy Desktop 7.1	Business data management tool
IBM WebSphere Application Server 3.5	Executes server-side Java components
IBM HTTP Server 1.3.12	Webserver
HP-UX 11.0	Server OS
Sun Solaris 8	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8i 8.1.6	Database
CommerceQuest Data Integrator 4.0.1	Data transfer service (100+ MB)
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
PEPS	PEPS to eCB	MQ, Data Integrator
FMS	eCB to FMS	MQ, Data Integrator

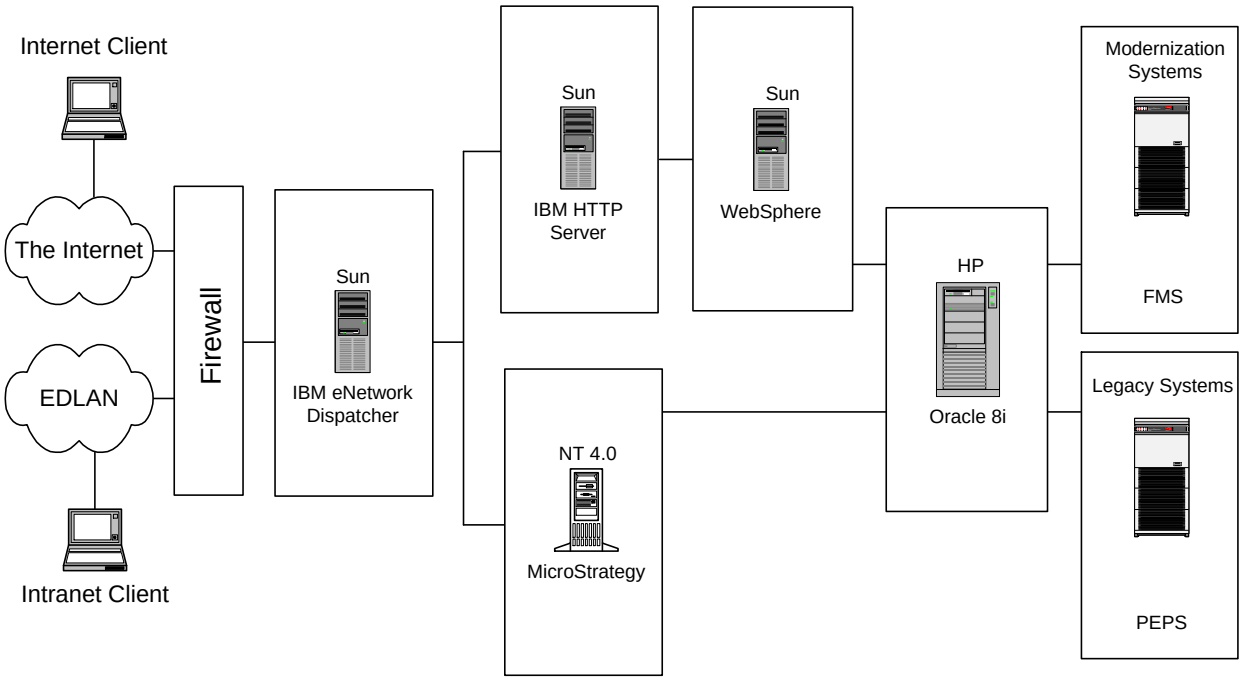

Figure 9 – eCB Technology Infrastructure

4.1.5 Enterprise Application Integration (EAI)

Description

The EAI Core Architecture effort consists of the design and implementation of the MQSeries integration architecture for the Department of Education, Office of Student Financial Assistance (SFA).

Collectively, the implementation of the EAI components and architecture is referred to as the EAI Bus. The EAI components provide the core architecture to enable SFA applications to utilize a common, reusable infrastructure for connecting disparate, heterogeneous systems. The EAI core architecture provides the EAI components and services to connect the SFA Internet Domain and nine SFA legacy systems to the EAI bus. Middleware communications are provided by MQSeries Messaging, transformation and routing is provided by MQSeries Integrator, and application connectivity is provided by the adapters.

Infrastructure Technologies:

Product	Use
Sun Solaris 7	Server OS
Microsoft Windows NT Server 4.0	Server OS
Sun Java Development Kit 1.3 (required for AMI)	Application messaging interface
IBM MQSeries Messaging 2.2.1.1	SFA EAI middleware comm. standard for OpenVMS
IBM MQSeries Messaging 5.2	SFA EAI middleware comm. standard for many platforms
IBM MQSeries Messaging 5.1	SFA EAI middleware comm. standard for NT 4.0
IBM MQSeries AMI 1.2.1	SFA EAI application messaging interface standard
IBM MQSeries Integrator 2.01	SFA EAI message transformation and routing
CommerceQuest Data Integrator 4.0.1	Data transfer service (100+ MB)
IBM DB2 6.1 (bundled with MQSI)	Database

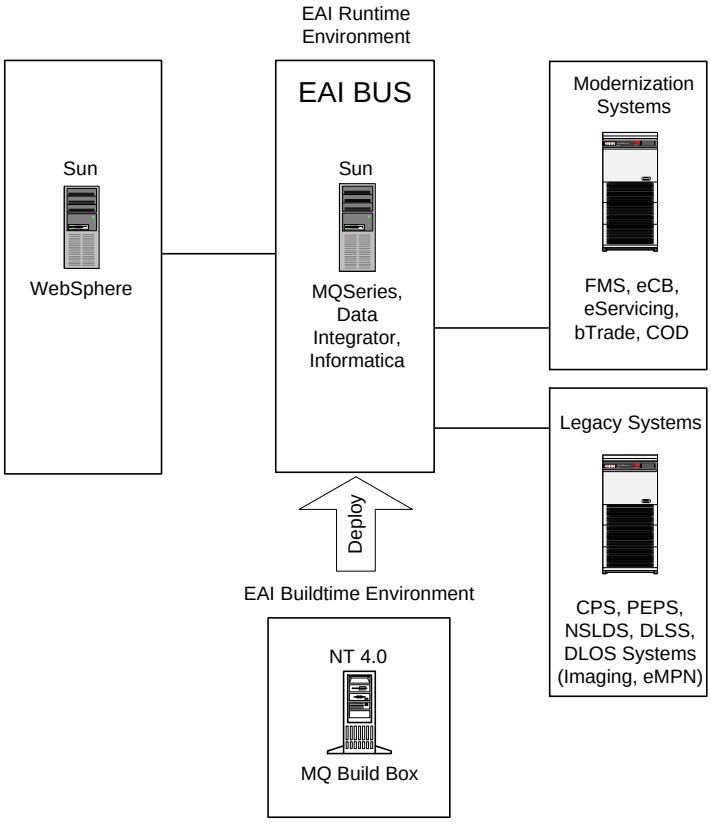

Figure 10 – EAI Technology Infrastructure

4.1.6 eServicing

Description

Direct Loan eServicing will provide Internet bill presentment and payment, On-Line Correspondence, and an enhanced Customer Management System. By integrating these three components, DLSS will provide a uniform and high-quality customer service experience for our borrowers regardless of how they choose to interact with DLSS – via the Internet, the VRU, or Customer Service Representatives (CSRs).

Infrastructure Technologies:

Product	Use
Microsoft Windows NT Server 4.0	Server OS
HP-UX 11.0	Server OS
Oracle 8i 8.1.6	Database
Microsoft SQL Server 7.0	Database
Siebel eFinance 6.3	Finance CRM application suite
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer
IBM MQSeries Server 2.0	SFA EAI interface queue client
IBM MQSeries Client 5.2	SFA EAI interface queue server
IBM MQSeries AMI 1.2.1	SFA EAI application messaging standard
IBM MQSeries Integrator 2.02	SFA EAI message transformation and routing
EDOCs (EBPP/OC)	Bill presentment and payment online correspondence tool
Avaya CentreVu CT	CTI software
Intervoice-Brite Write 1	IVR software
Avaya CentreVu CMS	CTI call management software

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
DLSS Oracle RDB	Bi-directional	MQ
CPS	To CPS	Direct access to Oracle stored procedures

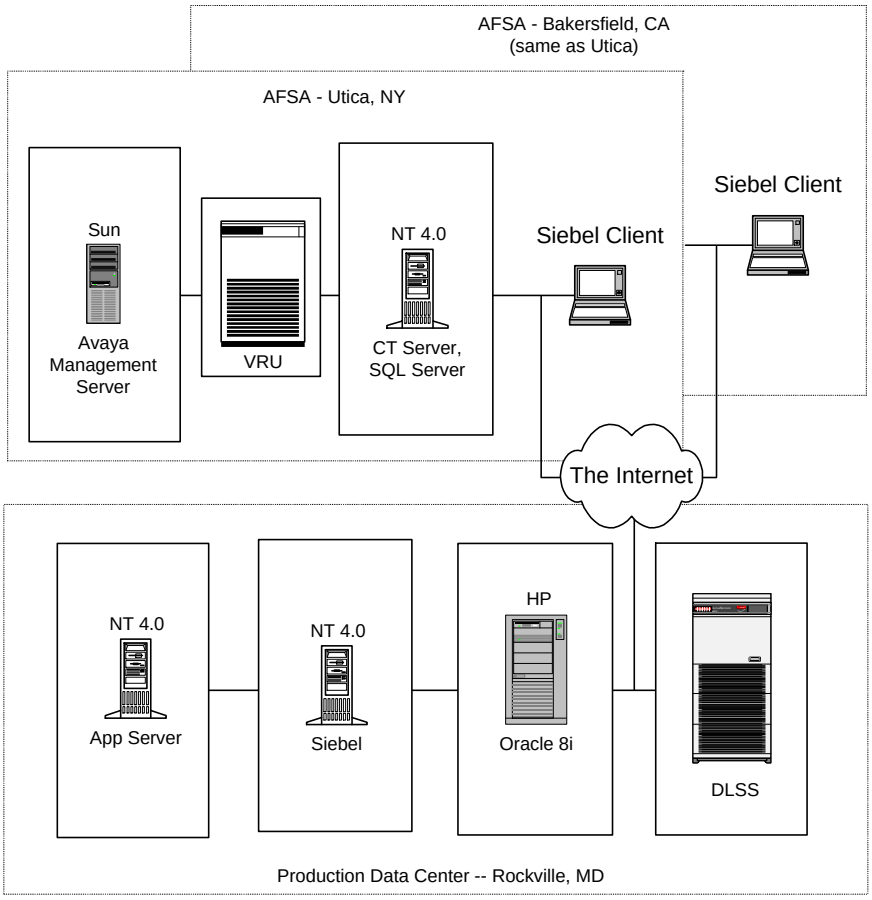

Figure 11 – eServicing Technology Infrastructure

4.1.7 FAFSA on the Web 6.0

Description

Free Application for Federal Student Aid (FAFSA) is an application used by college students and schools to submit financial aid applications via the Internet. The FAFSA on the Web redesign initiative is an effort to modernize FAFSA on the Web while accommodating an anticipated increase in users.

In the first release (FAFSA on the Web release 6), the architecture will migrate from a three-tiered architecture to an N-tier architecture where business and presentation logic are separated into different tiers. This approach will not only alleviate redundancy between applications, but will also be more easily integrated with both new and existing systems. In addition, an interim technical architecture solution will be used by moving the application server to the CIO standard architecture.

The PIN site will also be redesigned to increase usability and performance capabilities. The PIN site will be integrated with CIO's architecture standards, which may include the use of digital certificates.

In subsequent releases, a seamless user experience will be created between FAFSA on the Web, the Students Portal, and other state and institutional sites.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 3.6	Server load balancing tool
IBM WebSphere Application Server 3.5	Executes server-side Java components
IBM HTTP Server 1.3.12	Webserver
HP-UX 11.0	Server OS
Sun Solaris 8	Server OS
Oracle 8i 8.1.7	Database

Enterprise Services:

Product	Use
Tripwire 2.4	Host intrusion detection

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
PIN Site	Bi-directional	PIN API
CPS	Bi-directional	Batch

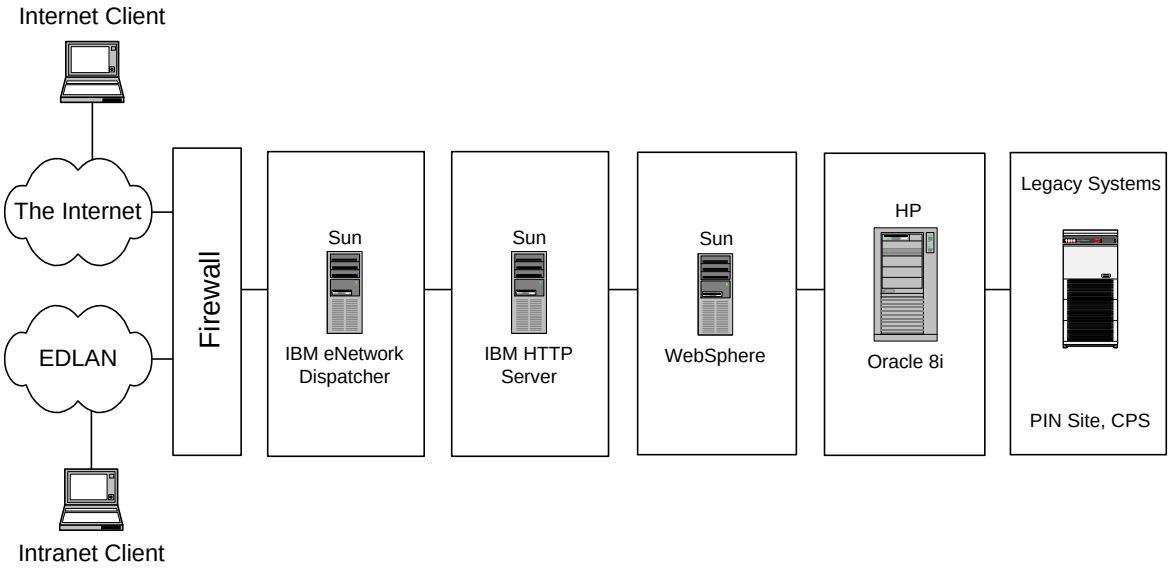

Figure 12 – FAFSA on the Web 6.0 Technology Infrastructure

4.1.8 Financial Management Systems (FMS)

Description

FMS, an Oracle Federal Financial System, manages the flow of all financial information across all of SFA. It facilitates the SFA transformation by giving the CFO office the ability to report information across programs, consolidate redundant processes, and account for SFA Title IV funds. Phase III of FMS was fully implemented on September 30, 2001. This phase incorporated core accounting for Direct Loan, Campus Based, Pell, and Debt Collection Services.

Infrastructure Technologies:

Product	Use
Oracle 8.0.5	Database
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer
IBM MQSeries AMI 1.2.1	SFA EAI application messaging standard
Oracle Financials 11.0.3	Accounting and financial management application suite

Enterprise Services:

Product	Use
Check Point Firewall-1	Network security firewall software
Tripwire 2.4	Host intrusion detection

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
Campus Based - EDCAPSFTP	Bi-directional	FTP
Debt Collection Service – EDCAPSFTP	Bi-directional	FTP
Direct Loan Origination – EDCAPSFTP	Bi-directional	FTP
Direct Loan Servicing - hpl10	Bi-directional	SQL*Net
Direct Loan Consolidation – hpl10	Bi-directional	FTP
FFEL Lenders – PROD/BLUE	Bi-directional	FTP
GAPS	Bi-directional	FTP
Pell – RFMS GL-PROD	Bi-directional	FTP, SQL*Net

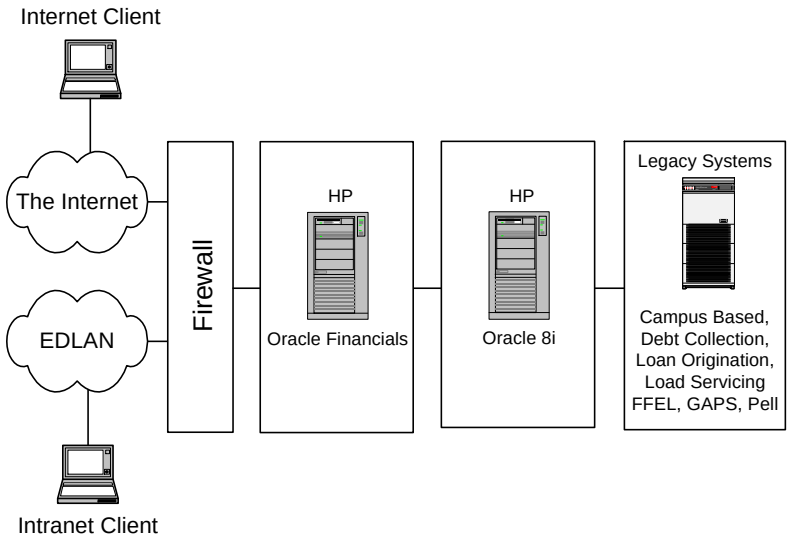

Figure 13 – FMS Technology Infrastructure

4.1.9 Financial Partners DataMart

Description

Within the Financial Partners (FP) Channel, data is fragmented across various legacy systems, making the process of extracting information time consuming, inconsistent, and costly. The FP Data Mart is the infrastructure/system that will provide customer information for employees and partners. The FP Data Mart will ultimately be the main source of consolidated customer information that will support several key business areas within the FP Channel.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
Microsoft IIS 4.0	Webserver
Microstrategy Intelligence Server 7.1.0 Release 4	Business analysis server
Microstrategy Web 7.1.0 Release 4	Web-reporting tool
Microstrategy Desktop 7.1.0 Release 4	Business data management tool
HP-UX 11.0	Server OS
Sun Solaris 2.6	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8i 8.1.6	Database
Informatica PowerCenter Server 1.7	Data acquisition and transformation tool

The CFO, FP, and CM Data Marts have identical architectures with the exception that CFO is on Oracle 8.1.7, while FP and CM are on 8.1.6.

Enterprise Services:

Product	Use
Tripwire 2.4	Host intrusion detection

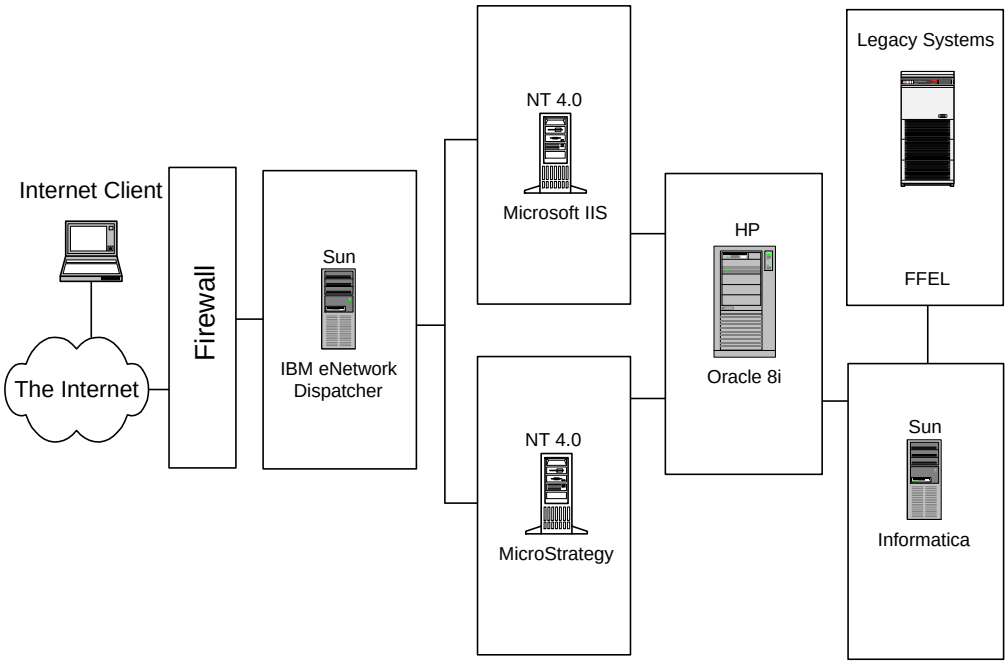

Figure 14 – Financial Partners Data Mart Technology Infrastructure

4.1.10 HR Modernization

Description

HR Modernization will use a phased approach in using existing and new technologies to provide integrated human resources capabilities. HR Modernization will implement a web-based tool that gives employees easy access to HR capabilities, anytime and anywhere.

Infrastructure Technologies:

Product	Use
Jamcracker 2.9	Customer management secure portal software

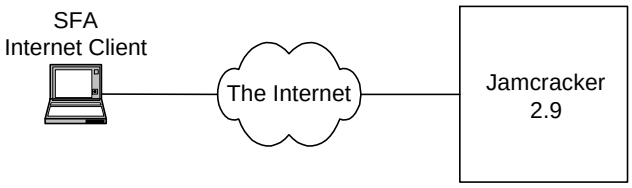

Figure 15 – HR Modernization Technology Infrastructure

4.1.11 Information for Financial Aid Partners (IFAP)

Description

The Information for Financial Aid Professionals (IFAP) web site (http://ifap.ed.gov) is an electronic library for financial aid professionals containing publications, regulations, and guidance regarding the administration of the Title IV Federal Student Financial Aid Programs. IFAP is managed by the Customer Support Branch (CSB) within Office of Student Financial Assistance Programs (OSFAP) of the Department of Education.

IFAP has a subscription option that notifies registered customers via email when new information (Dear Partner Letter, Announcement, Federal Register, etc.) has been added to the wealth of information available on IFAP. The email is customized based on users' subscription selections.

Users can select to be notified when new documents are added to the IFAP catalog based on Publication Type and Program/Service categories. Users can select more than one Publication Type or Program/Service category. Even if selections overlap, the system is designed to not send duplicate notifications of a single document.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
IBM WebSphere Application Server 3.5	Executes server-side Java components
IBM HTTP Server 1.3.6	Webserver
HP-UX 11.0	Server OS
Sun Solaris 2.6	Server OS
Oracle 8i 8.1.7	Database
Interwoven OpenDeploy 5	Web content automated replication and deployment software
Autonomy Knowledge Suite 2.1	Information management software (search engine)

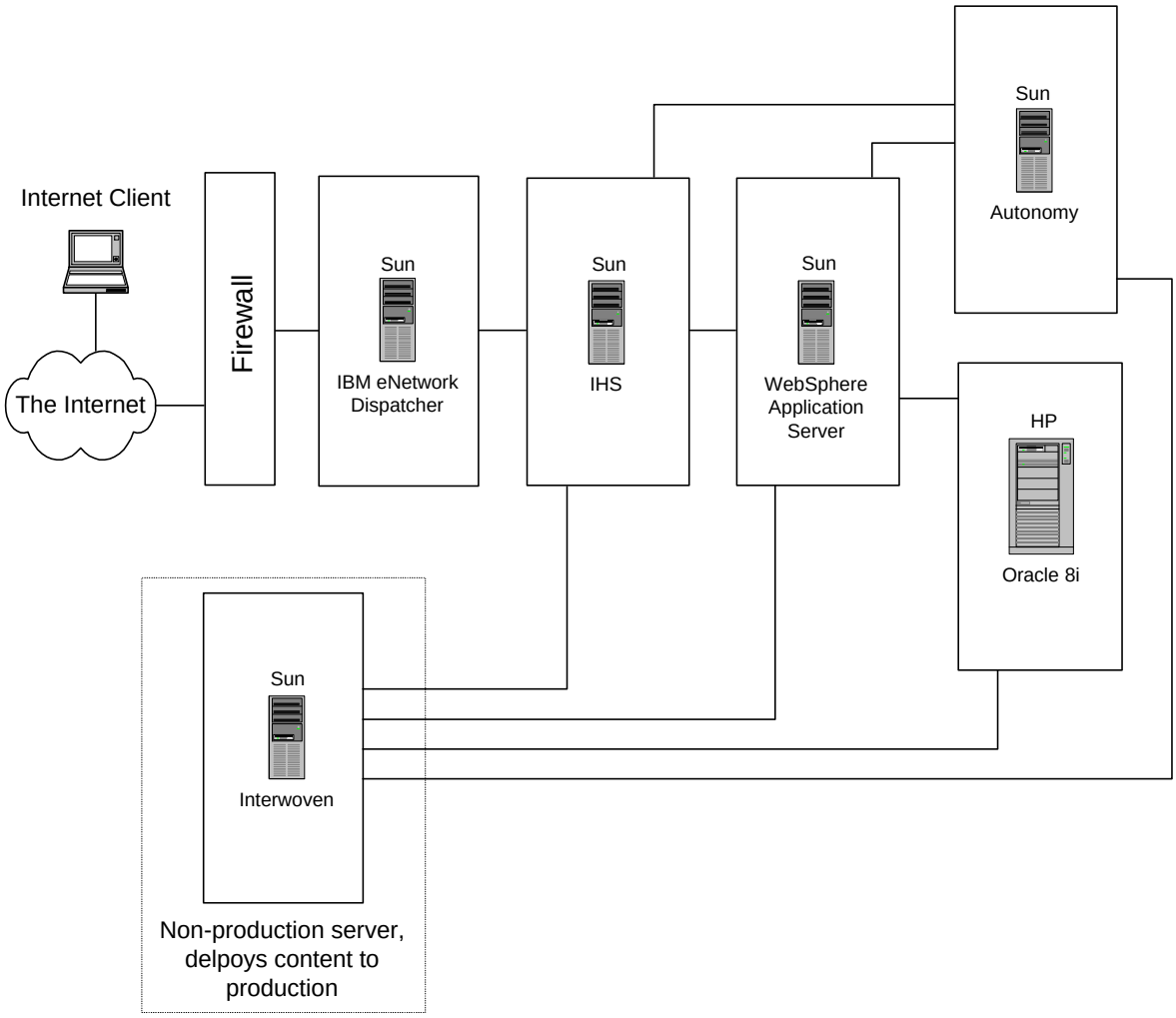

Figure 16 – IFAP Technology Infrastructure

4.1.12 Portals

Description

SFA is developing an enterprise portal strategy that utilizes a common architecture and enables each of the business channels to create a channel specific view. These views give the impression of separate portals providing information on each business channel and their unique processes, while operating on a single integrated architecture. Portals pull data from a variety of data sources and present the information in a consolidated fashion. With key information posted and accessible from an integrated web portal, SFA anticipates a reduction in calls to the call center and reduced complaint calls seeking clarification on processes. The completed Schools Portal View is the first component of the SFA enterprise portal. SFA is also planning development of a Students Portal and a Financial Partners Portal.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
IBM HTTP Server 1.3.6	Webserver
HP-UX 11.0	Server OS
Oracle 8i 8.1.7	Database
Allaire JRun 2.3 build 157	Application server
Interwoven OpenDeploy 4.2.1	Web content automated replication and deployment software
Autonomy Knowledge Suite 2.1	Information management software (search engine)
Portal Suite (TBD)	Portal software

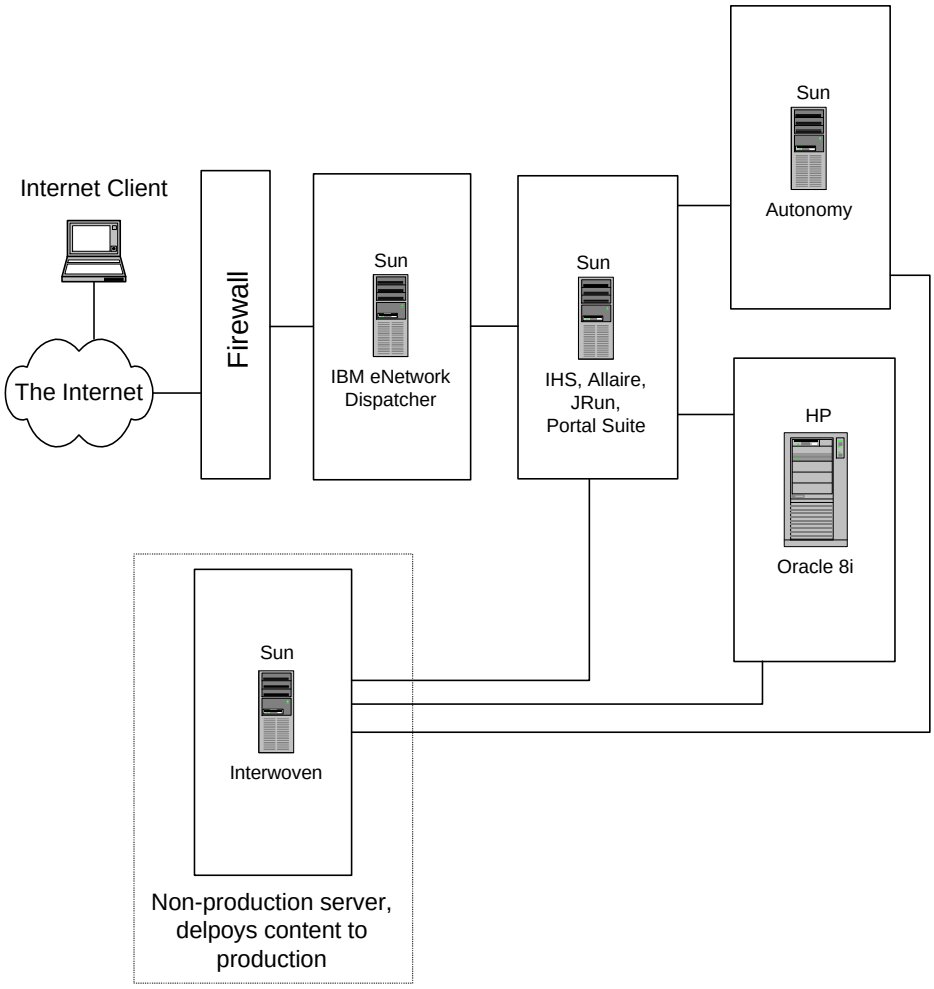

Figure 17 – Portals Technology Infrastructure

4.1.13 SFA Intranet

Description

SFA Intranet is the SFA enterprise intranet. Its function is to provide each organizational element in SFA with a standard forum for distributing information within the organization. In addition to organizing and retrieving documents for viewing on the desktop in a standard browser, it contains functionality to automate common internal administrative functions, such as ordering IT equipment and services.

Static content is served by an IBM HTTP Server running on a Sun server at the VDC. All transactional functionality, e.g., ordering equipment, providing feedback through email, etc, is provided by Java server-side J2EE components such as servlets and JSPs. These execute on an IBM WebSphere application server.

SFANet has a single Oracle database used by all transactional components that require persistent storage of data.

Infrastructure Technologies:

Product	Use
IBM eNetwork Dispatcher 2.1.2	Server load balancing tool
IBM WebSphere Server 3.5	Application server
IBM HTTP Server 1.3.6	Webserver
Sun Solaris 2.6	Server OS
HP-UX 11.0	Server OS
Oracle 8.1.5	Database
Interwoven OpenDeploy 5	Web content automated replication and deployment software
Autonomy Knowledge Suite 2.1	Information management software (search engine)

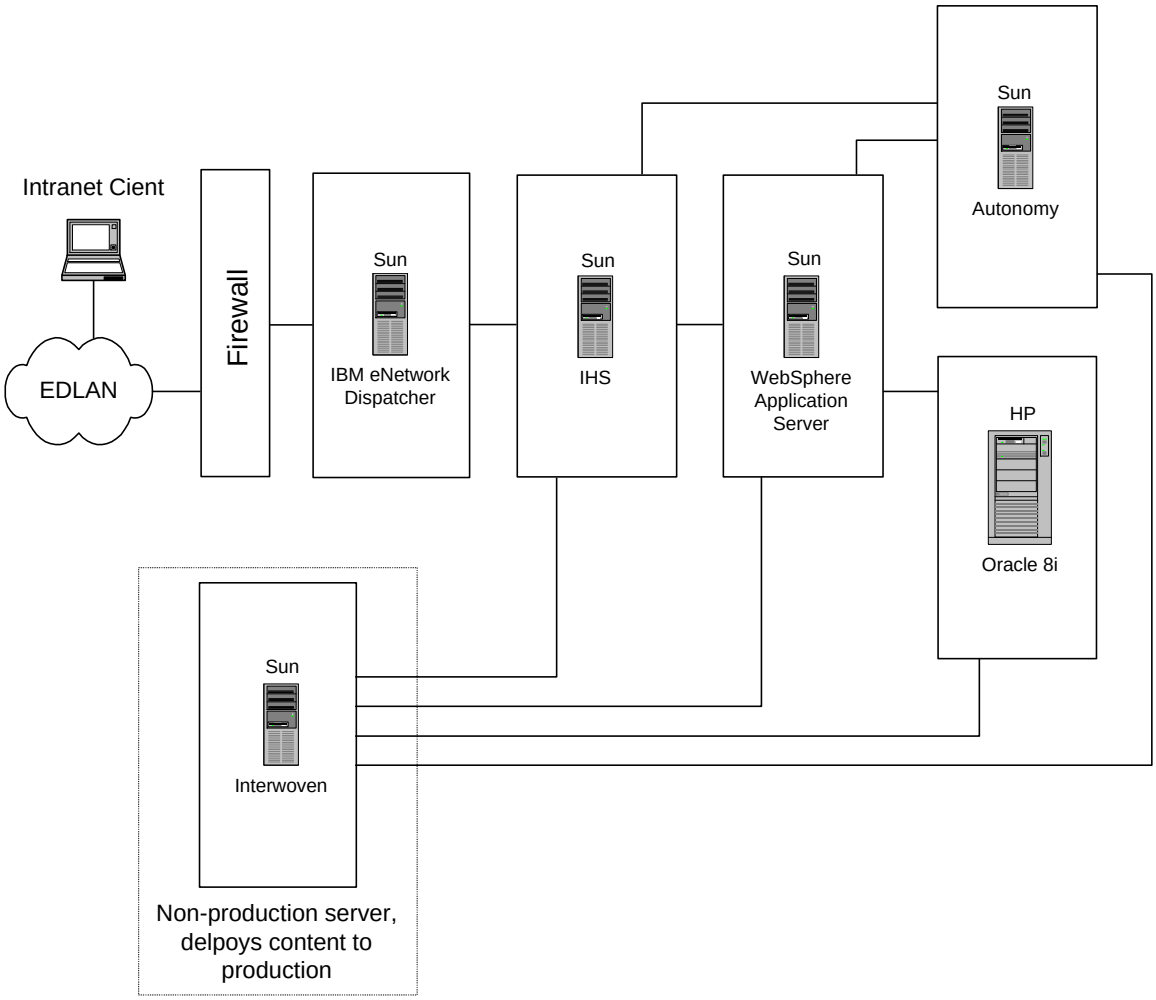

Figure 18 – SFA Intranet Technology Infrastructure

4.1.14 SFA to the Internet

Description

Substantial cost savings to SFA are achieved by moving SFA data transmissions to the Internet. The benefits of the initiative will provide SFA with a non-intrusive solution for constituents, reduce the overall cost of delivering student aid, and reduce operating costs through consolidation of operations and systems. SFA to the Internet went live on September 20, 2001.

Infrastructure Technologies:

Product	Use
Microsoft IIS 4.0	Webserver
HP-UX 11.0	Server OS
HP-UX 10.2	Server OS (production)
HP-UX 10.0	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8i 8.1.6	Database
IBM DB2 5.1	Database
bTrade	Transaction delivery network solution

The following client technologies are supported or deployed to users (students, services) by SFA to the Internet: OS/390 2.8, Sun Solaris 2.6, Sun Solaris 2.7, Sun Solaris 7, Sun Solaris 8, Windows 2000 Server, and Check Point Firewall-1

Enterprise Services:

Product	Use
IBM RACF 2.4	Security authentication and access authority component
Tripwire 2.4	Host intrusion detection
Hummingbird NFS Maestro Client 7.0	PC to NFS connectivity tool
McAfee	Virus protection software

SFA System Interfaces:

System	From/To (or Bi-directional)	Data Transfer Method
CPS	Bi-directional	Batch
PEPS	Bi-directional	Batch
FMS	Bi-directional	Batch
NSLDS	Bi-directional	Batch
eCB	Bi-directional	Batch
RFMS	Bi-directional	Batch
DLOS	Bi-directional	Batch
DLSS	Bi-directional	Batch

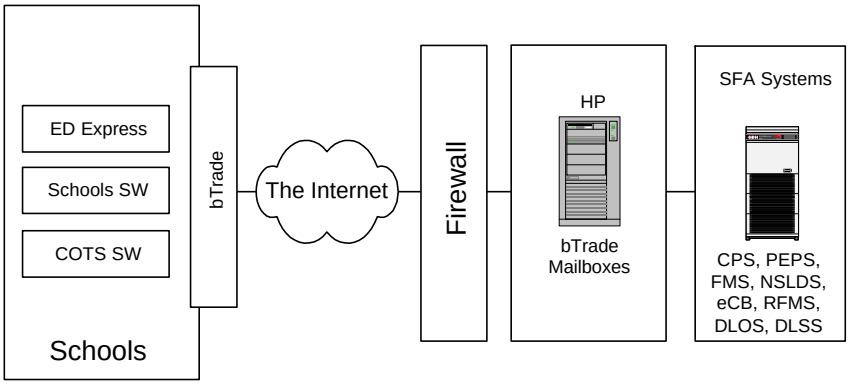

Figure 19 – SFA to the Internet Technology Infrastructure

4.2 SFA Legacy Systems

The Technology Infrastructure Blueprint includes high-level infrastructure details on those SFA legacy systems that have infrastructure elements that are relevant to the standardization, coordination, and integration of technologies among SFA modernization and legacy systems. This section contains summary text and a list of infrastructure technologies for SFA legacy systems. For quick reference, a matrix of SFA systems and technologies is provided in Appendix A. Additional details on legacy systems, including interface specifics, can be referenced in the *Legacy System Inventory Report*, Task Order #16, Deliverable #16.1.1.

4.2.1 Central Processing System (CPS)

Description

CPS is a mainframe application that computes an applicant's eligibility for Title IV SFA. CPS performs matches against IRS, SSA, and INS databases, produces summary data for States and institutions, supports Electronic Data Exchange (EDE) and Integrated Student Aid Management System (ISAMS), and calculates Estimated Family Contribution. The Student Aid Report (SAR) is printed and sent back to the applicant. Aid includes Pell Grants and FFEL student loans. CPS receives more than 10 million applications & correspondences annually.

Infrastructure Technologies:

Product	Use
0S/390 2.8	Mainframe OS
IBM CICS 4.1	Application server
IBM DB2 5.1	Database
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer

4.2.2 Direct Loan Consolidation System (DLCS)

Description

DLCS supports the Department of Education's Federal Direct Loan Program. DLCS allows borrowers to consolidate multiple student loans from multiple sources into one direct loan, funded and serviced by the Department of Education. DLCS provides mechanisms to convert DL and FFELP originated loans into DL loans.

Infrastructure Technologies:

Product	Use
HP-UX 11.0	Server OS
Informix 7.31	Database

4.2.3 Direct Loan Origination System (DLOS)

Description

The Direct Loan Origination System (DLOS) performs loan origination for regular originations and plus loan originations. DLOS provides direct interface with schools, 3rd party servicers, and the Student Account Manager (SAM). DLOS receives and processes all loan applications and disbursements, and records the receipt of the completed promissory note. It provides the principle communication link with the schools to regulate the flow of information. DLOS and RFMS are legacy systems that are being replaced by COD.

Infrastructure Technologies:

Product	Use
HP-UX 11.0	Server OS
Informix 7.31	Database

4.2.4 Direct Loan Servicing System (DLSS)

Description

DLSS services direct loans while borrowers are in school, in deferment status, or in repayment. DLSS receives all booked student loans from DLOS, and maintains them for their remaining life. DLSS performs functions including placing the loan into repayment at the proper time, billing the borrower, and tracking subsequent payments and delinquencies.

Infrastructure Technologies:

Product	Use
MicroStrategy InfoCenter 6.5	Personalized information portal software
Compaq Alpha Open VMS 7.2	Mainframe OS
Windows 2000 Server	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 7.0	Database
Microsoft SQL Server 7.0	Database
Microsoft SQL Server 2000	Database
Avaya CentreVu CMS	CTI call management software
Intervoice-Brite Write 1	IVR software

Enterprise Services:

Product	Use
Check Point Firewall-1	Network security firewall software

4.2.5 Federal Family Education Loan Program (FFEL)

Description

Federal Family Education Loan (FFEL) provides program management, payment of federal reinsurance on defaulted loan claims submitted by guaranty agencies, and collections on defaulted loans by GAs. FFEL supports collection process for federally guaranteed loans: receives defaulted loan data from GAs; interfaces with external systems, agencies and contractors for skip tracing; produces dunning notices; provides on-line support for collection agents; interfaces with private collection agencies; sets up loan repayment schedules; produces loan payment notices; and tracks receipts.

Infrastructure Technologies:

Product	Use
Oracle 8.0.5	Database
IBM MQSeries AMI 1.2.1	SFA EAI application messaging standard
Oracle Financials 11.0.3	Accounting and financial management application suite

Enterprise Services:

Product	Use
Check Point Firewall-1	Network security firewall software
Tripwire 2.4	Host intrusion detection

4.2.6 National Student Loan Database System (NSLDS)

Description

NSLDS centralizes all Title IV student aid data obtained from schools, guaranty agencies, and many internal SFA systems. The first stage of the modernization effort in FY01 was to find ways to improve customer service delivery and the processes and techniques around NSLDS without significant technology change. In a future phase, SFA will determine how to integrate data from NSLDS and other sources using data store technology.

Infrastructure Technologies:

Product	Use
Microsoft IIS 4.0	Webserver
0S/390 2.8	Mainframe OS
IBM CICS 2	Application server
Microsoft Windows NT Server 4.0	Server OS
IBM DB2 5.1	Database
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer

Enterprise Services:

Product	Use
IBM RACF 2.2	Security authentication and access authority component

4.2.7 Post-secondary Education Participants System (PEPS)

Description

Post-secondary Education Participants Systems (PEPS) is used to provide a management information system with consistent and reliable data, and flexible reporting concerning post-secondary institutions, accrediting bodies, state licensing agencies, lenders, and guarantors for a large number of users with diverse business needs.

Some major functions include:

- Provide data on school participation: eligibility, certification, address, and program participation
- Provide institutional reviewer data
- Support annual default rate calculation for FFEL and Direct Loan schools
- Log hardware/software problem calls from PEPS users and forwards them to the appropriate area of response
- Provide audit data on schools, lenders, and guarantee agencies (including interface to Dept. of ED OCPO
- Run SQL queries for the SFA community (internal and external)
- Monitor and record GA and lender servicer participation and default rates
- Provide audit data on lenders and guarantee agencies including interface to Dept of ED OCPO
- Use Federal School Code File to look up school codes for FAFSA completion

Infrastructure Technologies:

Product	Use
HP-UX 10.2	Server OS
Microsoft Windows NT Server 4.0	Server OS
Oracle 8.0.3	Database
IBM MQSeries Messaging 5.2	SFA EAI interface transport layer

4.2.8 Recipient and Financial Management System (RFMS)

Description

The Recipient and Financial Management System is used to generate obligation information and to monitor grant funds at both the institution and the recipient level. RFMS does this by performing the following functions: authorizing the distribution of funds through the participating institutions to permit payment of vouchers; monitoring the use of funds throughout the award year to permit reallocation of supplemental awards as necessary to correspond with student attendance; verifying institutional expenditures through comparing disbursements reported at the recipient level; responding to informational requests from institutions, recipients, and others; defining, collecting, and reporting data to assist in the evaluation of the Pell Grant program and in projecting future needs.

DLOS and RFMS are legacy systems that are being replaced by COD.

Infrastructure Technologies:

Product	Use
IBM CICS 4.1	Application server
MVS	Mainframe OS
Microsoft Windows NT Server 4.0	Server OS
IBM DB2 5.1	Database

Enterprise Services:

Product	Use
IBM RACF 2.4	Security authentication and access authority component

5. DEVELOPMENT INFRASTRUCTURE

5.1 Infrastructure Physical Diagram

The majority of SFA systems use a standard development infrastructure, detailed in

Figure **20** below. This standardization helps reduce the cost, complexity, and start up time for a new effort.

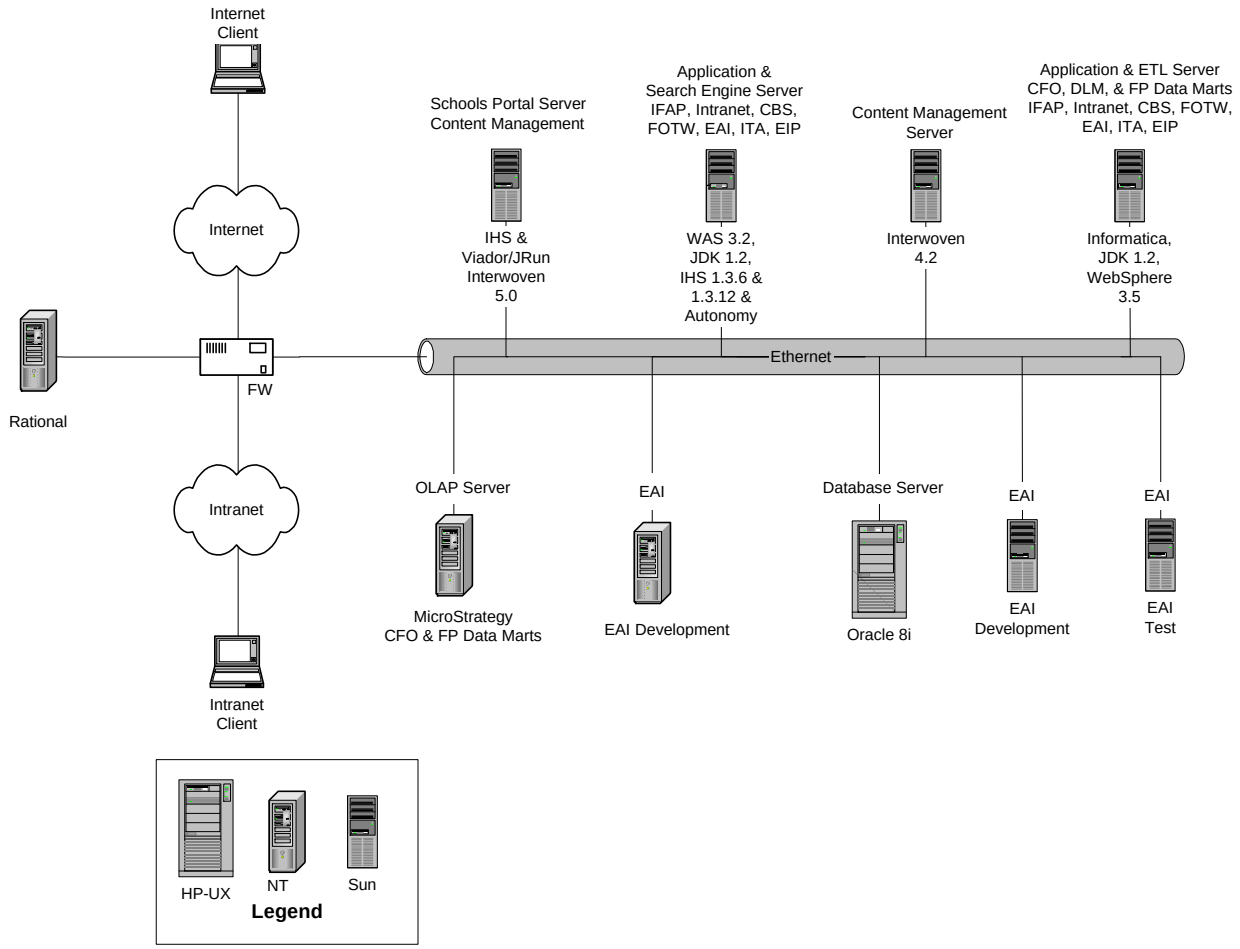

Figure 20 – SFA Standard Development Infrastructure

5.2 Development Infrastructure

The Development Infrastructure provides the development tools, methods, standards and procedures that support the project teams involved in the analysis, design, construction and maintenance of SFA business applications.

The infrastructure also provides an environment for component-based solutions that support the analysis, design and construction phases of the development process. It is the combination of these development tools, methods, standards and procedures that are essential for a comprehensive, integrated environment for developing and maintaining systems. In addition, the development architecture provides a starting point for the technical design and build of a development environment and identifies key concepts and components for the environment.

The SFA development infrastructure is based on the development framework shown in Figure 21. The development framework provides a structured environment that reduces the effort and costs involved with designing, implementing and maintaining an integrated development environment. The development environment is built upon an integrated set of tools and components, each supporting a specific task or set of tasks in the development process.

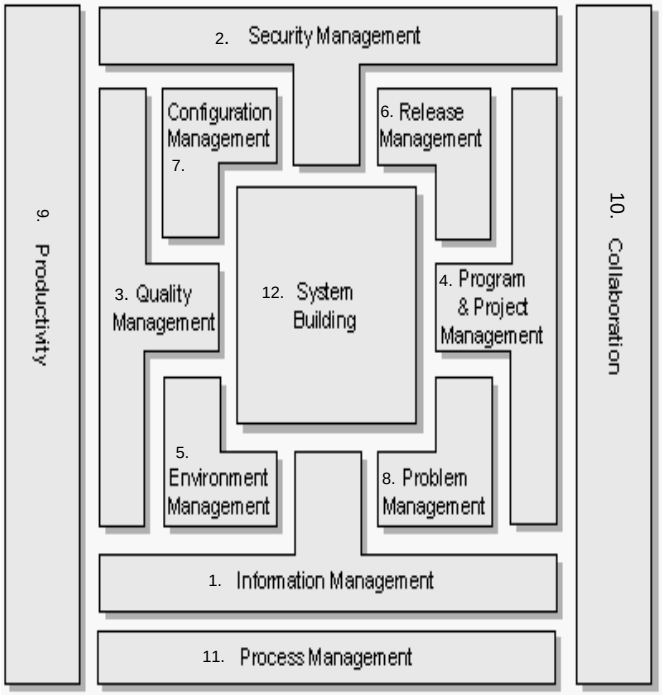

Figure 21 – Development Environment

The table below provides a brief description of the services provided by Development Infrastructure.

Development Architecture Component	Standardized Product	Description
1. Information Management Tools	Delivery Excellence (11/07/01)	Manage the information that supports the entire project – information that is used both in systems building and in other management processes.
2. Security Management Tools	None	Enable the development and maintenance of security components.
3. Quality Management Tools	None	Ensure that an agreed-on level of quality in the system is reached. They are also used to provide information and process for improving the quality over time.
4. Program and Project Management Tools	Rational Rose	Assist the management teams in their daily work.
5. Environment Management Tools	None None None None	Comprised of the following tools to support Environment Management in the development environment. **Change Management** – Supports the various aspects identifying and managing change in the development environment, the key tool is the Data & Software Distribution which enables automated distribution of data and software to the workstations and servers of the development environment. **Service Management** – Supports various aspects of supporting and managing the interface with the developers. **Service Planning** – Planning required to anticipate and implement changes to the other areas: service management, systems management, change management and strategic planning. **System Management** – Supports the various aspects of supporting and managing the operation of the distributed system
6. Release Management Tools	Rational Rose	Manages the simultaneous development of multiple releases.
7. Configuration Management Tools	Rational Rose Interwoven TeamSite	Covers the version control, migration control and change control of system components such as code and its associated documentation.
8. Problem Management Tools	Rational Rose	Pertain to the problem tracking and solution process.
9. Productivity Tools	Microsoft Suite	Productivity tools provide the basic functionality required to create documents, spreadsheets and simple graphics or diagrams. Personal Productivity tools are typically packaged as integrated suites of software. These packages provide the basic functionality required to create documents, spreadsheets and simple graphics or diagrams. More recently, the ability to access the Internet and browse electronic documentation has been added to the suite of Personal Productivity tools. - Spreadsheet - Graphics - Word Processor
10. Collaborative Tools	None	Enable groups of people to communicate and to share information, helping them work together effectively, regardless of location.

Development Architecture Component	Standardized Product	Description
11. Process Integration Tools	None	Enforce the correct sequencing of tasks and tools in conformance with a pre-defined methodology.
12. System Building Tools	IBM Visual Age for Java	Visual Age for Java enables developers to quickly develop or modify JAVA software.
	IBM Web Server	The Web Server is used for the 'thin' client presentation function.
	MQ System Integrator	MQ System Integrator is used to support message transformation and routing.
	Viador Portal	The portal provides a predefined customizable framework for rapid application development (RAD).
	Team Site Content Management	Manages the website content set in a process-oriented fashion for both structured and unstructured content formats.
	Autonomy Search Engine	The search engine is used for Web Spidering and Content Searching.

6. OPERATIONS INFRASTRUCTURE

SFA's IT operations are executed through the Virtual Data Center (VDC). SFA's information systems have been designed to be platform independent, which enables its partners to operate the VDC to be most efficient, and does not restrict them to use only the technologies identified in the Technology Infrastructure Blueprint. For the purposes of this document, the technologies used in the VDC are considered out of scope.

APPENDIX A – PRODUCTION INFRASTRUCTURE MATRIX

The SFA Production Infrastructure Matrix provides a quick reference of the core technologies in use among the existing systems of SFA.

SFA EXECUTION INFRASTRUCTURE MATRIX	MicroSoft IIS 4.0	MicroStrategy Intelligence Server 7.0.2	MicroStrategy Intelligence Server 7.1.0 Rel. 4	MicroStrategy Web 7.1.0 Rel. 4	Microstrategy Web 7.1 TBD	MicroStrategy InfoCenter 6.5	MicroStrategy Desktop 7.1.0 Rel. 4	Microstrategy Desktop 7.1 TBD	IBM eNetwork Dispatcher 2.1.2	IBM eNetwork Dispatcher 3.6	IBM Websphere Application Server 3.5	IBM HTTP Server 1.3.6	IBM HTTP Server 1.3.12	Allaire JRun 2.3 build 157	IBM OS/390 2.8	IBM CICS 2	IBM CICS 4.1	MVS	Compaq Alpha Open VMS 7.2	HP-UX 10.0	HP-UX 10.2	HP-UX 11.0	Sun Solaris 2.6	Sun Solaris 7	Sun Solaris 8	Windows 2000 Server	Microsoft Windows NT Server 4.0
CFO Data Mart	x		x	x			x		x													x	x				x
Common Orig. & Disbursement (COD)																											
Credit Managing Data Mart	x		x	x			x		x													x	x				x
eCampus Based (eCB)		x			x			x	x		x		x									x			x		x
Enterprise App. Integration (EAI)																								x			x
eServicing																						x					x
FAFSA 6.0										x	x		x									x			x		
Financial Mgmt. Systems (FMS)																											
Financial Partners DataMart	x		x	x			x		x													x	x				x
HR Modernization																											
Info for Financial Aid Partners (IFAP)									x		x	x										x	x				
Portals									x			x		x								x					
SFA Intranet									x		x	x										x	x				
SFA to the Internet	x																			x	x	x					x
Central Processing System (CPS)															x		x										
Direct Loan Consolidation System (DLCS)																						x					
Direct Loan Origination System (DLOS)																						x					
Direct Loan Servicing System (DLSS)						x													x							x	x
Fed. Family Ed. Loan Program (FFEL)																											
NSLDS	x														x	x											x
PEPS																					x						x
Recipient and Financial Mgmt Sys (RFMS)																	x	x									x

SFA EXECUTION INFRASTRUCTURE MATRIX	Oracle 7.0	Oracle 8.0.3	Oracle 8.0.5	Oracle 8i 8.1.5	Oracle 8i 8.1.6	Oracle 8i 8.1.7	DB2 5.1	DB2 6.1	Microsoft SQL Server 7.0	Microsoft SQL Server 2000	Informix 7.31	IBM MQSeries Messaging 2.2.1.1	IBM MQSeries Messaging 5.1	IBM MQSeries Messaging 5.2	IBM MQSeries Server 2.0	IBM MQSeries Client 5.2	IBM MQSeries AMI 1.2.1	IBM MQSeries Integrator 2.01	IBM MQSeries Integrator 2.02	Java Development Kit 1.3	bTrade	CommerceQuest Data Integrator 4.0.1	Interwoven OpenDeploy 4.2.1	Interwoven OpenDeploy 5	Siebel eFinance 6.3	Autonomy Knowledge Suite 2.1	Oracle Financials 11.0.3
CFO Data Mart						x																					
Common Orig. & Disbursement (COD)																											
Credit Managing Data Mart					x																						
eCampus Based (eCB)					x									x								x					
Enterprise App. Integration (EAI)								x				x	x	x			x	x		x		x					
eServicing					x				x					x	x	x	x		x								
FAFSA 6.0						x																					
Financial Mgmt. Systems (FMS)			x											x			x										x
Financial Partners DataMart					x																						
HR Moderninzation																											
Info for Financial Aid Partners (IFAP)						x																		x		x	
Portals						x																	x			x	
SFA Intranet				x																				x		x	
SFA to the Internet					x		x														x						
Central Processing System (CPS)							x							x													
Direct Loan Consolidation System (DLCS)											x																
Direct Loan Origination System (DLOS)											x																
Direct Loan Servicing System (DLSS)	x								x	x																	
Fed. Family Ed. Loan Program (FFEL)			x														x										x
NSLDS							x							x													
PEPS		x												x													
Recipient and Financial Mgmt Sys (RFMS)							x																				

SFA EXECUTION INFRASTRUCTURE MATRIX	Informatica PowerCenterServer 1.7	Jamcracker 2.9	EDOCs (EBPP/OC)	Avaya CentreVu CT	Intervoice-Brite Write 1	Avaya CentreVu CMS	Hummingbird NFS Maestro Client 7.0	Check Point Firewall-1	IBM RACF 2.2	IBM RACF 2.4	Tripwire 2.4	McAfee	TSYS Components (including TSYS MQ)
CFO Data Mart	x										x		
Common Orig. & Disbursement (COD)													x
Credit Managing Data Mart	x										x		
eCampus Based (eCB)													
Enterprise App. Integration (EAI)													
eServicing			x	x	x	x							
FAFSA 6.0											x		
Financial Mgmt. Systems (FMS)								x			x		
Financial Partners DataMart	x										x		
HR Moderninzation		x											
Info for Financial Aid Partners (IFAP)													
Portals													
SFA Intranet													
SFA to the Internet							x			x	x	x	
Central Processing System (CPS)													
Direct Loan Consolidation System (DLCS)													
Direct Loan Origination System (DLOS)													
Direct Loan Servicing System (DLSS)					x	x		x					
Fed. Family Ed. Loan Program (FFEL)								x			x		
NSLDS									x				
PEPS													
Recipient and Financial Mgmt Sys (RFMS)										x			